

# Use of fibroblasts in cosmetics

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Bachelor Thesis

Universitat Autònoma de Barcelona, 2014  
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## Introduction

Gradual decline in function over time and cumulative damage caused by environmental factors, like smoking, exposure to chemicals, and ultraviolet B (UVB) radiation, stimulate collagenase production, and the resulting collagen degeneration results in the impairment of the structural integrity of the dermal extracellular matrix (ECM) causing the skin to wrinkle. Collagen fragmentation alters the physical properties of the dermal microenvironment and reduces ECM binding to fibroblasts, which in turn lessen mechanical forces. This cellular response promotes further loss and fragmentation of collagen, thereby promoting self-perpetuating progression of the aged phenotype in human skin.

## Stimulators of fibroblasts

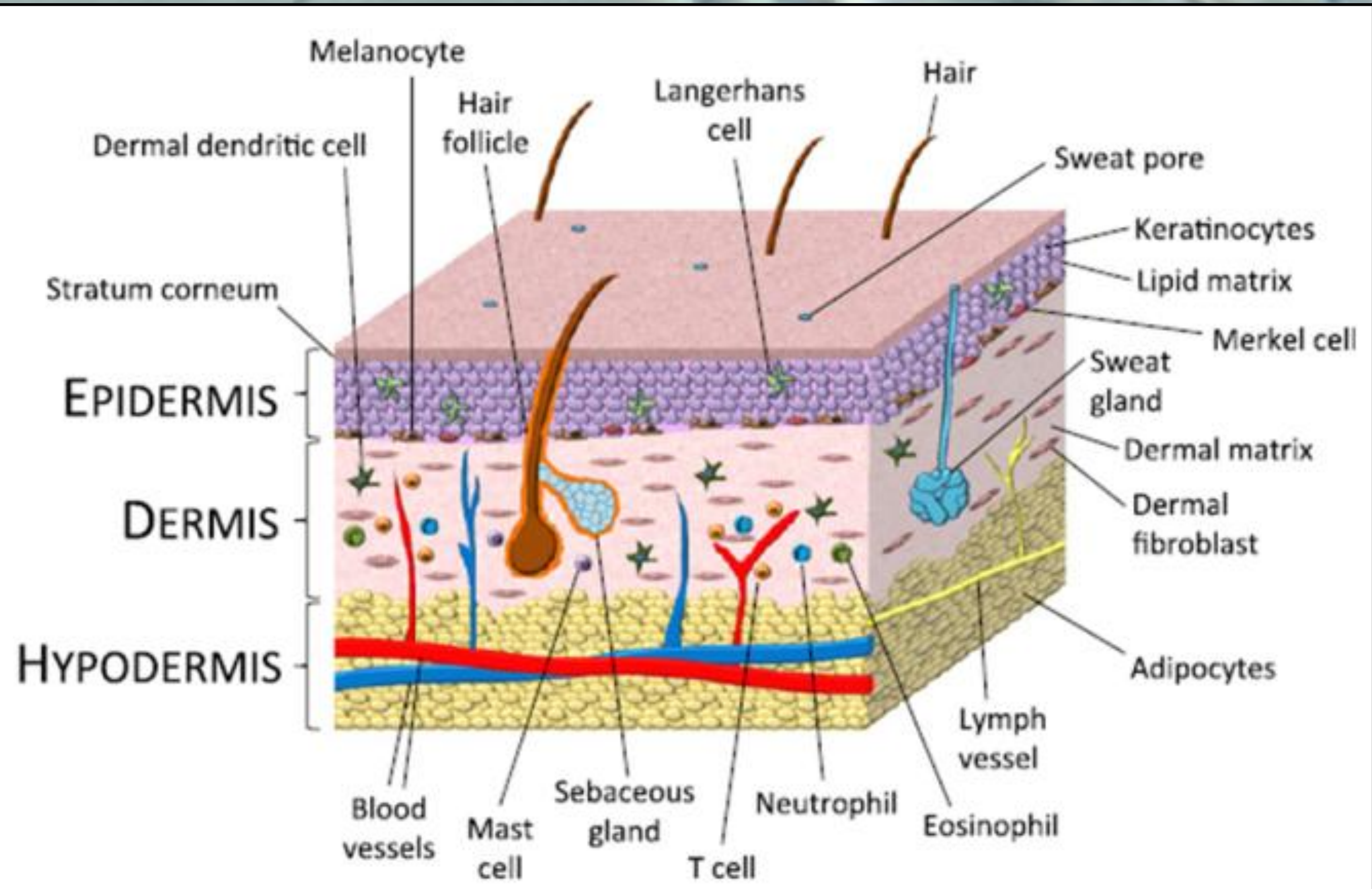
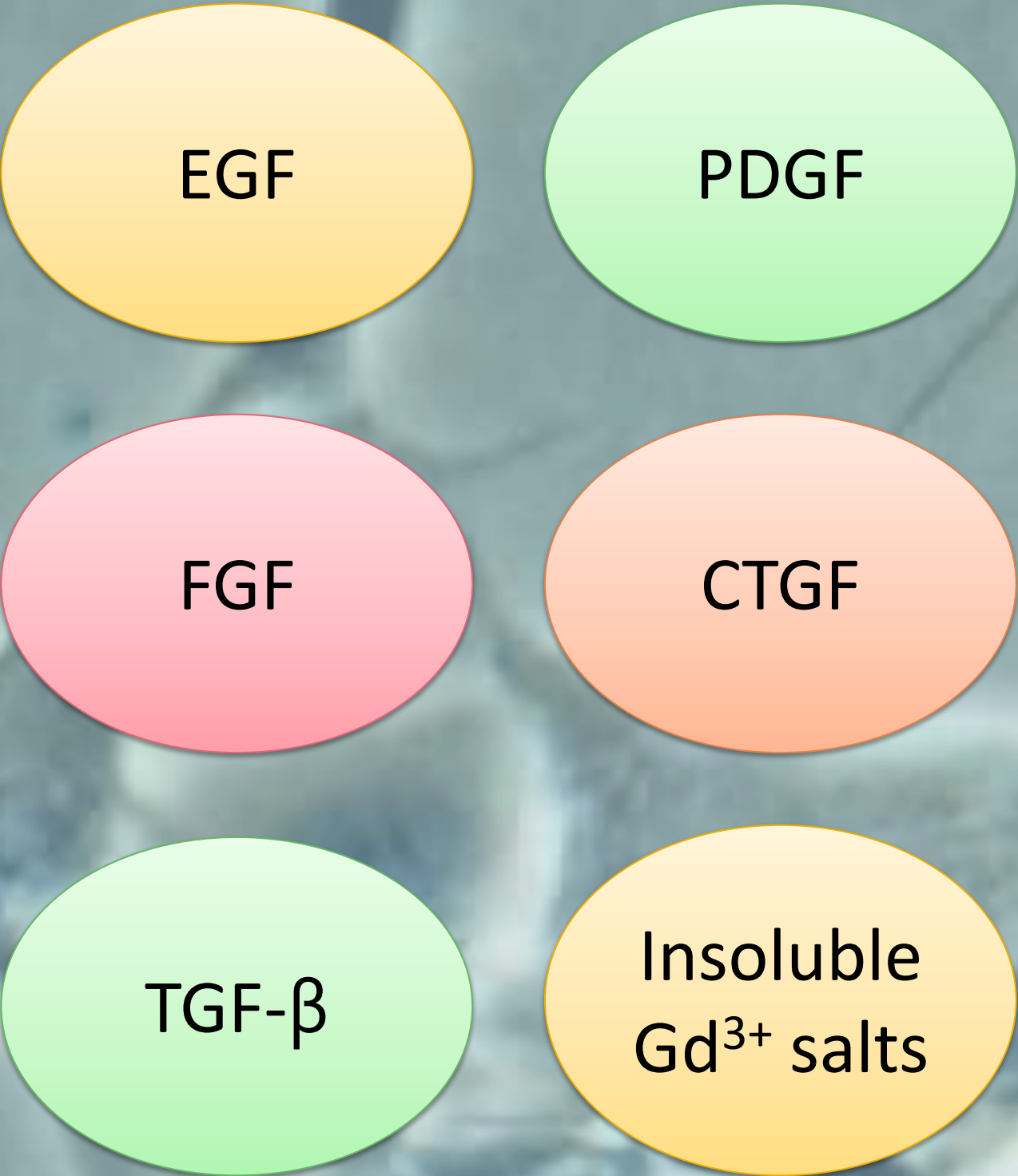


Fig. 1. Structure and components of skin

## Use of fibroblasts in aesthetics treatments

**PRP (platelet-rich plasma) THERAPY:** It is an autologous preparation of platelets in concentrated plasma. Large amounts of growth factors are released from the  $\alpha$ -granules of platelets, stimulating proliferation and differentiation of fibroblasts and regulating their migration and attachment, so synthesis of collagen and other matrix components is promoted, thus, rejuvenating skin. The preparation method consists in obtaining a blood sample from the patient and mix it with an anticoagulant, then centrifugate it to obtain the plasma containing platelets and leukocytes, do a second round of centrifugation and use the pellet containing platelets, mixed with an activator, as autologous PRP.

**FIBROBLASTS' CULTURE *IN VITRO*:** It is a cellular therapy thought for the correction of scars and wrinkles. 3mm punch biopsies are collected from behind the ear, where the skin is likely to have received less sun exposure, and the tissue is briefly digested with enzymes. The isolated cells are seeded, propagated and expanded to obtain an approximate concentration of  $10^7$  cells/mL, and then injected in the patient's skin.



Fig. 2. Improvement in acne scarring after injection of cultured fibroblasts

**CO-CULTURED FIBROBLASTS-KERATINOCYTES ON 3D MATRICES OF SERICIN:** Keratinocytes and fibroblasts are co-cultivated on a 3D sericin construct. Cells are taken from the own patient to prevent immune rejection and improve body integration. This structure provides an environment very similar to the one we have *in vivo*, and thus, it may be useful as a skin equivalent for grafting and a help in wound healing.



Fig. 3. Before and after treatment with PRP therapy.

**BIODEGRADABLE HYDROGELS FOR THE CONTROLLED GFs RELEASE:** These hydrogels are used to retain the growth factors and prevent them to act at once in order to prolong their effects. They can control the speed of release depending on the amount of water the hydrogel is composed of, and they have positive or negative charges depending on the growth factors to be released. Once inside the patient, if an electrostatic change occurs, charges will destabilize the hydrogel and the GF will be released. In addition, the hydrogel provides security so the growth factor will not be degraded by enzymes in circulation.

## Conclusions

- The realization that dermal fibroblasts have regenerative potential in skin repair and rejuvenation has led to the development of cell therapies for a variety of skin indications. These include the treatment of surgical and burn wounds, chronic wounds such as diabetic and pressure ulcers, cosmetic indications such as treating facial wrinkles and hair growth in androgenetic alopecia.
- PDGF, FGF, EGF, CTGF and TGF- $\beta$  have shown mitogenic properties with fibroblasts and thus, they have been used in many tissue repair and rejuvenating therapies, mixed with matrices, scaffolds, grafts or hydrogels.
- Fibroblasts are beneficial in cosmetic and aesthetic treatments, promoting collagen production and ECM deposition.

## Bibliography

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